



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# PUBLIC HEALTH REPORTS

---

VOL. 31

DECEMBER 1, 1916

No. 48

---

## POLIOMYELITIS (INFANTILE PARALYSIS).

### THE ACCURACY OF DIAGNOSIS UNDER EPIDEMIC CONDITIONS.

In a recent number of the bulletin of the New York City department of health it is stated that of the 9,418 cases which were reported during the epidemic of poliomyelitis in New York City this year, 4,474 were treated in the health department hospitals. Of these 4,474 cases sent to the hospitals, 96 of the patients were found after observation not to have any serious illness. Of the remaining 4,378 patients, 49 turned out to have diseases other than poliomyelitis.

This shows that of the cases and suspected cases sent to the hospitals the diagnoses were correct in approximately 97 per cent and that in only 3 per cent was the illness from which the patients suffered not poliomyelitis. This is a better result than might have been expected under the circumstances. With the prevailing epidemic conditions and the intense public interest it would be but natural that the practicing physicians and parents should have constantly in mind the possibility that any acute illness might be poliomyelitis and that there would be a tendency to err in erroneously calling many cases of illness infantile paralysis.

The diseases affecting the 49 cases not having poliomyelitis were varied. There were 2 cases of hysteria, 8 of tuberculous meningitis, 4 of broncho-pneumonia, 2 with diphtheritic paralysis, and 3 with cerebrospinal meningitis.

---

## RELATIONSHIP OF MILK SUPPLIES TO TYPHOID FEVER.<sup>1</sup>

By W. H. FROST, Passed Assistant Surgeon, United States Public Health Service.

The general nature of the relationship between milk supplies and the dissemination of typhoid fever is so well understood that, especially before this association, a detailed discussion of the avenues through which milk may become infected, or of the principles and method of safeguarding milk supplies from this danger, would be superfluous. There are, however, certain important particulars in which our present

---

<sup>1</sup> Presented before American Association of Medical Milk Commissions, Cincinnati, Ohio, June 10, 1916.

knowledge of the relationship between milk supplies and the prevalence of typhoid fever is deficient; and it is the intention in this paper to invite attention to this lacking information, with only a brief preliminary review of well-known facts and established principles.

#### **FACTORS DETERMINING INFLUENCE OF MILK SUPPLIES IN DISSEMINATION OF TYPHOID FEVER.**

Milk may become infected with typhoid bacilli through essentially the same channels as other foods and beverages, and is probably not more exposed to such infection than are various other foods; certainly it is less exposed than many vegetables in common use, and much less exposed than surface waters. Milk differs from the other usual vehicles of typhoid infection, however, in that it affords an excellent medium for the multiplication of typhoid bacilli; whereas in the other most common vehicles of transmission typhoid bacilli tend under usual conditions to decrease very rapidly. The control of milk supplies, therefore, constitutes a special problem in typhoid prophylaxis, chiefly because it must take account of this ever-present danger of multiplication of infective material once introduced. This likelihood of multiplication, together with the extensive use of unheated milk, makes it imperative that milk supplies be safeguarded with more rigid precautions than are required in the protection of any other food.

The influence of a milk supply in disseminating typhoid fever would appear to be determined by the following simple factors:

- (1) The sources of infection to which the milk is exposed.
- (2) The opportunities afforded for infective material to be introduced into the milk from these sources, or per contra, the precautions taken to safeguard against the introduction of infective material.
- (3) Circumstances affecting the potentiality of the milk supply in disseminating infection after infective material has once been introduced.

##### **Sources of Infection.**

Milk supplies are, in general, exposed to typhoid infection in proportion as they are exposed to contamination with human discharges, and in proportion as these discharges are likely to contain typhoid bacilli. Other things being equal, the likelihood that typhoid bacilli may be present in some of the discharges with which a milk supply may become contaminated is proportionate to the number of persons in dangerous contact with the milk supply. We may consider as in dangerous contact not only those persons who actually handle the milk, but all whose discharges might in any way infect the supply. Again, given a certain number of persons in such contact with a milk

supply, the probability that some of these persons may be infected with typhoid is of course proportionate to the past and present prevalence of this disease among them. These principles are commonly recognized and applied in the control of milk supplies in measures taken to reduce the number of persons handling milk, and more especially in the measures taken to secure prompt reports of all cases of suspected illness among the milk handlers. It is recognized, however, that such measures can never afford perfect protection, since a considerable number of people must inevitably come into more or less intimate contact with any milk supply, and, even with the most efficient system of reporting and isolating all suspicious cases of illness, there still remains the danger of infection from chronic bacillus carriers and from atypical or incipient cases of fever.

#### **Precautions in Handling.**

Given a certain number of *sources* of infection to which a milk supply is exposed, the safety of the supply depends next upon the precautions exercised to prevent the introduction of infective material from these sources. Among such precautions may be classed the observance of rigid personal cleanliness by milk handlers; the protection of milk from "dirt" of all kinds; protection from flies by screening, and the sterilization of all vessels, for protection against the introduction of infection in wash water or in containers returned from customers' homes. In brief, the points upon which a dairy is ordinarily scored are chiefly measures of precaution to prevent the introduction of infective material. Again, however, it is fully recognized that even with the utmost care, these precautions can never be perfect, so that there still remains a not inconsiderable danger of occasional disastrous infection.

#### **Potentiality of Infected Supply.**

The next consideration to be taken into account is the extent of damage, that is, the number of cases of typhoid fever likely to result when infective material has once been introduced into a milk supply. In this connection the opportunities afforded for multiplication of typhoid bacilli are of prime importance, and presumably these depend largely upon the time elapsing before distribution and the temperature at which the milk is held, matters receiving attention in every well regulated system of milk control. Because of the ever-present possibility that typhoid bacilli introduced into milk may multiply, large supplies made up of many contributions from various sources, mixed before distribution, are especially dangerous, since under these circumstances contamination of even a small portion may infect the whole supply. A few gallons of milk from a single farm which, if distributed directly would have gone to only a few score consumers,

may, by mixing, infect the whole of a large supply distributed to hundreds, thus multiplying the possibilities of infection among the consumers. Under equivalent conditions of control large assembled milk supplies are consequently more dangerous than small supplies distributed directly from the producers.

The extent of the damage which may result from an infected milk supply may be limited, to a considerable extent, by intelligent control of typhoid fever in the community in which the milk is consumed, provided that this control is based upon such careful and immediate study of cases as will enable the prompt recognition of any milk-borne epidemic and the inauguration of measures to prevent further infection from that supply. However, such measures, even when taken promptly, are necessarily belated, since a milk-borne epidemic can hardly be recognized, at the earliest, less than 10 days after the infection of the supply at fault.

Undoubtedly the most efficient single safeguard against disaster from a milk supply which has become accidentally infected is efficient pasteurization as the last step before delivery to the consumer, with due precaution to avoid all possibility of infection subsequent to pasteurization. From the standpoint of the prevention of typhoid fever and other infectious diseases, pasteurization may well be considered an essential adjunct to all other safeguards, since, in all the other defenses against infection, there are numerous breaks which can be guarded against only by this final measure of destroying such infectious material as may have slipped past the first lines of defense.

#### **QUANTITATIVE RELATION OF MILK SUPPLIES TO TOTAL INCIDENCE OF TYPHOID FEVER.**

The foregoing principles are well recognized and generally applied in the control of milk supplies, and it is well known that according to the efficiency with which they are carried out the indicated measures reduce or, with thoroughly efficient universal pasteurization, probably eliminate the dangers of typhoid infection from milk. It is not known, however, to what extent, under actual conditions of control, as found in modern cities, milk-borne infection contributes to the total prevalence of typhoid fever. It may be questioned whether it is of real importance to determine with any precision the extent of this influence of milk supplies, so long as its existence is recognized; but in fact the importance of such knowledge is not open to question. The best possible argument in any propaganda for better supervision of milk supplies is a well-proven statement of the consequences of neglect, enabling a contrasting statement of the extent of protection afforded by efficient control in terms of cases of disease and deaths prevented. The public is fairly well able to distinguish between the logical statement of results based on satisfac-

tory demonstration and rash, sweeping claims based merely on enthusiastic conviction. The proper control of milk supplies accomplishes much more than the prevention of milk-borne typhoid fever; but, since the prevention of typhoid is one of the most readily demonstrable and measurable results, it is especially deserving of such careful quantitative study as will yield this definite information.

#### Epidemic Outbreaks.

The effect most definitely attributable to milk in contributing to the prevalence of typhoid fever is in the causation of distinct, clearly marked epidemic outbreaks readily traceable to milk supplies. It is beside the question to discuss the distinctive epidemiologic features of milk-borne outbreaks. It is sufficient to state the generally accepted fact that the recognition of any considerable epidemic of typhoid fever due to the infection of a single milk supply is one of the simplest of all problems in epidemiology. The first indication or suspicion of such an outbreak is based ordinarily upon the occurrence of a disproportionate number of cases among the consumers of a single milk supply; and to recognize such a disproportionate incidence it is necessary only to have, on the one hand, full and prompt reports of all cases of typhoid fever, giving reliable information as to the use of milk and sources of supply of each patient, and, on the other hand, a knowledge of the amount of milk sold by each dealer. With these data available, as they should be in every health department, the recognition of milk-borne epidemics is primarily a matter of book-keeping, each case of typhoid being charged against the dealer upon whose route it occurs, with prompt investigation of every suspected supply. The problem is indeed so simple that failure to recognize promptly any considerable outbreak due to the infection of one among the many milk supplies of a city is utterly inexcusable, attributable either to gross negligence or utter incompetence on the part of local health authorities.

Because of the simple epidemiology involved, it is probable that milk-borne epidemics are recognized in greater proportion than epidemics due to any other cause, and the literature of recent years is full of reports of such epidemics in all parts of the civilized world. Trask<sup>1</sup> has collected reports of 179 such epidemics of typhoid fever, and this number could now be greatly increased by a review of more recent literature. But, though milk-borne epidemics of typhoid fever are so common and so frequently reported in the literature, there has apparently been but little if any effort made to ascertain for any large population for a considerable period of years what proportion the cases occurring in such epidemics contribute to the

<sup>1</sup> Trask, J. W. Milk as a Cause of Epidemics of Typhoid Fever, Scarlet Fever, and Diphtheria. Hyg. Lab. Bull. No. 41, U. S. Pub. Health and Marine Hosp. Service, Washington, 1908.

total of typhoid incidence. In the preparation of this paper no opportunity has been afforded for an extensive search for statistics on this point, but the following more or less scattered observations may be cited as illustrating the probable magnitude of milk-borne epidemics as a factor in the total incidence of typhoid fever in cities of the United States.

In connection with studies of the consequences of stream pollution, under the writer's direction, sanitary surveys have been made of all cities of more than 10,000 inhabitants on the Ohio River watershed, with special reference to the prevalence and causes of typhoid fever. Among other data, information was collected as to the number, extent, and causes of recent epidemics in each city visited. Excluding Pittsburgh, Cincinnati, and Louisville, our records refer to 25 cities of over 25,000 inhabitants each, located on the Ohio watershed, having an aggregate average population during the period from 1910 to 1914, inclusive, of slightly more than 1,600,000. The control of milk supplies in these cities is very irregular, but probably represents a fair average of that exercised in other American cities of comparable size. For instance, it is reported that approximately 50 per cent of the milk sold in 20 of these cities was pasteurized at the time of the survey, about 40 per cent by the "holding" system, and about 10 per cent by the so-called "flash" methods. In 10 of the 25 cities there was, in 1915, when our survey was made, no systematic study of typhoid fever, hence milk-borne outbreaks, unless very extensive, would almost certainly have been overlooked. In the remaining cities the reporting and studying of cases of typhoid fever were more or less irregular, but sufficient to justify the expectation that distinct epidemics would be recognized and investigated.

During the 5 years 1910 to 1914, inclusive, distinct milk-borne outbreaks of typhoid fever, totaling 446 cases, were reported in 7 of these cities. The total number of cases of typhoid fever reported in all 25 cities during that period was 8,260; therefore the cases attributable to distinct milk-borne epidemics constituted approximately 5.4 per cent of all reported cases. The morbidity reports in many of these cities were, however, very deficient; and, judging from the number of typhoid deaths reported, it is probable that the number of cases of typhoid actually occurring in these cities during this period was much in excess of those reported, probably about 24,000. Estimated on this basis the cases attributed to milk-borne outbreaks constitute approximately 2 per cent of the total cases of typhoid. This figure, however, is probably an underestimate, since, as has been already noted, the investigation of typhoid cases in some of these cities has not been sufficiently careful to insure the recognition of all distinct milk-borne epidemics.

More reliable figures, though applied to a smaller population, have been collected by the commission of the Public Health Service which, during a period of four years, 1906 to 1909, made a careful study of the prevalence and causes of typhoid fever in the District of Columbia. It is stated in the final report of this commission<sup>1</sup> that during each of the four years of their investigation one or more distinct milk-borne epidemics of typhoid fever were recognized, and that the cases occurring in such outbreaks during the years 1906, 1907, and 1908 constituted about 10 per cent of all the cases originating in the District of Columbia and investigated during the summer period (May 1 to Nov. 1) of these years. During the next year, 1909, one milk-borne outbreak was recognized, including 13 cases, or about 2.3 per cent, of the cases investigated during that year.

On the other hand, in Richmond, Va., where typhoid fever has been studied very closely since June, 1907, the city health officer, Dr. Levy,<sup>2</sup> states that during this period of seven and one-half years in the study of about 2,300 cases of typhoid no distinct epidemic attributable to infection of the milk supply has been recognized, and undoubtedly had such an outbreak occurred it would have been recognized. As a further instance of the proportion which cases occurring in distinct milk-borne epidemics bear to the total cases of typhoid fever, Dr. Allen W. Freeman, formerly assistant commissioner of health of Virginia, states<sup>3</sup> that during the six years when he was intimately associated with the investigation of every epidemic of typhoid reported in the State, only two milk-borne epidemics, totaling about 100 cases, were observed in Virginia cities, in a total incidence of approximately 12,000 cases of typhoid fever. Milk-borne epidemics therefore contributed only about 0.8 per cent of these cases. During that time every epidemic attracting local attention was reported to the State board of health and thoroughly investigated, and any other considerable milk-borne outbreaks would undoubtedly have been reported and recognized as such.

The population groups included in Washington and in Richmond and Virginia cities as a whole are too small to warrant general conclusions as to the proportion which cases occurring in milk-borne outbreaks contribute generally to the total incidence of typhoid fever, and the data cited for cities on the Ohio watershed, though covering a larger population, are not based on sufficiently careful and uniform studies. The percentages above cited must therefore be considered as merely illustrative, not representative or average figures.

<sup>1</sup> Lumsden, L. L., and Anderson, John F., Report No. 4 on The Origin and Prevalence of Typhoid Fever in the District of Columbia. Hyg. Lab. Bull. No. 78, U. S. Pub. Health and Mar. Hosp. Serv., Washington, 1911.

<sup>2</sup> Ann. Rept. of Health Dept. of the City of Richmond, Va., for the year ending Dec. 31, 1914.

<sup>3</sup> Personal communication.



**Endemic or Perennial Typhoid.**

Epidemic outbreaks such as have been discussed represent, however, only the peaks of the influence of milk in the causation of typhoid fever; they afford no proper measure of its total effect, which is much more difficult to estimate. Undoubtedly, in addition to causing distinctly recognizable epidemic outbreaks, infection of milk supplies is responsible for more or less numerous scattered cases of typhoid fever, not sufficiently grouped to be readily recognizable as epidemics and traceable to their source. As to what constitutes a "recognizable epidemic" no general rule can be given; it depends upon a number of factors—the absolute and relative size of the milk supply in question, the usual rate of typhoid prevalence in the community, the sequence and grouping as well as the number of cases, and the collateral evidence afforded by attendant circumstances. In large cities, with individual milk supplies distributed to thousands of consumers, and especially where their distribution is largely at wholesale, to hotels, restaurants, and drug stores, a very considerable number of cases actually due to infection of a large milk supply may occur without being definitely evidenced as an epidemic. The total of such scattered or "sporadic" cases due to infection conveyed in milk may, in a period of years, be equal to, greater, or less than the sum total of cases definitely traceable to milk supplies in epidemics. Information on this point is exceedingly scanty, hardly warranting a guess.

In this connection an instance cited by Hill<sup>1</sup> is exceptionally instructive. Having occasion to investigate an epidemic of 10 cases of typhoid fever occurring in a Minnesota village of some 700 to 800 inhabitants, he found that not only these 10 epidemic cases, but all the cases of typhoid fever occurring in that community during the previous five years were among the customers of a single milk dealer; and as the result of his investigation he reached the justified conclusion that all the cases of typhoid fever occurring in that community during five years had been caused by infection of this one milk supply. The source of infection was evidently a typhoid-bacillus carrier on the dairy farm, whose only connection with the handling of the milk was in washing the cans. During the five years preceding the occurrence of the epidemic of 10 cases which occasioned Dr. Hill's investigation, 11 other cases attributed to infection of this milk supply had occurred "in small, scattered numbers, at considerable and irregular intervals." This extraordinary instance, while not warranting any general conclusions, affords a clear-cut demonstration of the possibility that an infected milk supply may cause scattered cases at intervals throughout a period of years before giving rise to a distinct epidemic outbreak; and it is significant that the total of these scat-

<sup>1</sup> Hill, H. W., All the Typhoid of a Community for Five Years from a Carrier through Milk, *Am. Jour. Pub. Health*, Vol. IV, No. 8, Aug., 1914.

tered cases in this instance exceeded the number of cases occurring in the final discrete epidemic.

As regards the other factors of prime importance in the causation of typhoid fever, chiefly polluted water and the improper disposal of human excreta, resulting in exposure of discharges to flies and other carriers, our knowledge of their relative importance in the sum total of agencies contributing to the perennial or endemic prevalence of typhoid is fairly definite, at least much more so than our present knowledge of the rôle of milk supplies. This may be ascribed to two main reasons—that these are relatively large, often predominating, factors, and that in more or less numerous instances abrupt changes in conditions have served to demonstrate the extent of their previous effect.

There are on record many instances where a highly polluted water supply, used by the whole population of a city, has been abruptly abandoned for a pure or far less polluted supply obtained by efficient purification or from another source. The decrease in the prevalence of typhoid fever following such a radical change in quality of water supply has been so striking, prompt, and consistent in the many instances on record as to fully warrant the conclusion that the decrease in typhoid was the result of improvement in the quality of water supply. The extent of this decrease has therefore afforded at least an index, if not a measure, of the previous effect of the polluted water supply in contributing to the prevalence of this disease. Judging by the reduction in prevalence following installation of a pure water supply, the use of polluted water appears to have been responsible in many cities for the greater part of the total typhoid incidence, sometimes as much as 80 per cent, or even more.

In recent years a smaller number of similar demonstrations have served to indicate the rôle played by general food contamination resulting from the disposal of human excreta in privies and vaults exposed to flies and other carriers, two of the most notable demonstrations having been made in Richmond, Va., and Jacksonville, Fla. In both these cities the energetic action of efficient local health departments has resulted in abolishing or at least properly regulating open privies and vaults, and in both cities a striking reduction in typhoid prevalence followed immediately upon the effective inauguration of these measures. A close study of the circumstances makes it evident that these reductions in typhoid prevalence must be attributed largely to the abolishing and safeguarding of privies, and thus the magnitude of their previous influence has been indicated.

The influence of these two major factors in the causation of typhoid fever has therefore been demonstrated by radical and abrupt changes in conditions in such manner as to enable a rough quantitative estimate of the previous net effect of the conditions changed. A

proportion has thus been established between these and all other factors in the general prevalence of typhoid fever in the communities where the demonstrations have been made, and fairly definite conclusions have been justified as to the probable effect of similar conditions in other communities. However, even with such abrupt and sweeping changes as have been made in the quality of water supplies and conditions of sewage disposal, the influence of these factors could not have been so clearly discerned had it not been relatively *large*, sufficient to make an unmistakable reduction in the total prevalence of typhoid following these changes.

As compared to our knowledge and appreciation of the importance of water supplies and faulty sewage disposal in typhoid causation, our conception of the rôle played by city milk supplies is far less definite, and for obvious reasons. In the first place, changes in the efficiency of the control exercised over city milk supplies have generally been gradual rather than abrupt. Unlike the abrupt change from a highly polluted to a pure water supply, which for a whole city may be dated almost to a day, the change from a poorly controlled to a well safeguarded milk supply is usually gradual, associated with the coincident development of other measures tending to produce similar results, and thus to obscure the effects achieved by improvement in the milk supply. To a large extent radical improvement in the control of a milk supply must necessarily be achieved slowly, involving as it does the education of dealers and distributors, and extensive improvements in the plants of individual dairymen.

Practically the only radical change which can be made universally effective for a whole city's milk supply within a brief period is prohibition of the sale of raw milk, requiring universal pasteurization. Such a change has recently been made in this city (Cincinnati, Ohio). An ordinance requiring the pasteurization of all market milk excepting the small amounts sold as "certified" and "inspected" went into effect July 1, 1914, and, according to the health officer of the city, Dr. Landis, pasteurization became generally effective by January 1, 1915. It is to be hoped and expected that close studies of typhoid fever in this and other cities will serve to indicate clearly just what reduction in prevalence of this disease is actually effected by such change in the milk supply.

Another reason why the influence of milk in the causation of typhoid fever has not been so well established as, for instance, the effect of water, is that in all probability milk supplies generally play a less prominent rôle. It is quite within the range of possibility, by a close continued epidemiologic study of the endemic typhoid in a city, to arrive at well justified and fairly definite estimates of the relative importance of the several more prominent agencies con-

tributing to the prevalence of this disease. However, any such conclusion must be based upon evidence which is purely circumstantial, indirect, and inexact; evidence which does not justify singling out each of the many factors entering into the causation of typhoid fever in the community and assigning to each a definite weight and importance. It is possible, by such a study, only to distinguish the probable relative importance of various factors, to determine which are the major and which the minor. Only to the major factors, whose influence is predominating, can anything like a reasonably accurate quantitative influence be ascribed. For example, after a careful study it might be possible to estimate fairly accurately that the substitution of a pure for a polluted water supply or the abolition of privies and vaults would eliminate a certain proportion of the typhoid in a community. It might be certain, too, that a further reduction would be effected by improvement of the milk supply, but the extent of this could not be estimated with the same degree of precision.

It is understood, of course, that the relative prominence of the milk supply as a factor in typhoid prevalence doubtless differs in different communities. In general, other things being equal, the milk supply is probably a relatively more important factor in communities where other factors have been most successfully controlled. It hardly seems probable that the milk supplies of large cities can, without universal pasteurization, be controlled as effectively as their water supplies, and it is probable that in large cities where the water supply and other agencies in the causation of endemic typhoid fever have already been well controlled, the proportion of typhoid contributed by the milk supply is relatively larger, although the actual incidence per unit of population may be smaller than in cities with less effective general typhoid prophylaxis.

To review briefly the foregoing discussion: The dangers of milk as a vehicle for the dissemination of typhoid fever are quite fully and commonly understood, and the principles of control measures, based upon this knowledge, are well established, though more or less inefficiently applied in actual practice. However, having as yet no very definite quantitative idea of the extent of the effect of uncontrolled milk supplies in typhoid prevalence, we can have no better idea of the efficiency of such control as is actually exercised in various cities, or of the net reduction in typhoid prevalence which might with assurance be expected to result from more efficient control. Definite knowledge on these points is of far more than academic interest. It is of the utmost importance, not only as giving a better and much needed index of relative values in various phases of typhoid prophylaxis, but also as affording the best and most convincing kind of evidence upon which to base a plea for popular support of any movement for more efficient control of milk supplies.

### Further Studies Required.

Considering the importance of this lacking information, it is rather surprising that so little systematic, organized effort has been made to collect it, and it would appear that comprehensive studies with this object in view promise fruitful results.

The relative importance of milk-borne epidemic outbreaks in contributing to the total prevalence of typhoid fever could be estimated with fair accuracy from a compilation of the statistics available in the records of a number of large cities where typhoid fever has, for a period of years, been studied with sufficient care to enable the recognition of such outbreaks. To be of value, such statistics must include a sufficient number of cities for a sufficient period of years, to enable subdivisions of the data into groups according to nature and efficiency of the local measures of control.

The most favorable opportunities for studies of the total effect of milk in contributing to the prevalence of typhoid fever are probably afforded in cities where the influence of other agencies in the causation of this disease has been reduced to a minimum, as is the case in a number of our larger cities. Intensive studies of the prevalence and causes of typhoid fever similar to that conducted in Washington, D. C., should be carried on in every city, including special studies with reference to the influence of milk; and the results of such studies should be made more generally available than is now the case.

Finally, perhaps the best of all opportunities for estimating the influence of milk supplies will be found in cities where an abrupt change is made in the efficiency of control by ordinances or regulations requiring universal pasteurization. With the constantly growing sentiment in favor of pasteurization as a necessary safeguard for municipal milk supplies, it may be confidently expected that the next few years will witness this requirement in a considerable number of cities. While the chief object of this action, when taken, will be to afford protection to the public, it may at least be hoped that, when the change is made, the opportunity afforded for acquiring much needed information will not be overlooked. In order that the influence of universal pasteurization in reducing typhoid prevalence should be clearly defined, it will, of course, be necessary primarily that the pasteurization be actually efficient, carried out with such thoroughness as to virtually eliminate milk-borne typhoid infection, since any conclusions drawn from inefficient pasteurization will be worse than useless. And, from the standpoint of instructiveness, it is desirable that the change from an unpasteurized to a pasteurized supply be made within a short period; also that it be preceded as well as followed by proper epidemiologic studies of endemic typhoid fever in the community.